Under the Microscope: Interview Series #3

Simple LED Illumination System saves the day in Brazil

Tim Self
Head of the School of Life Sciences Imaging Unit,
University of Nottingham

Email:
tim.self@nottingham.ac.uk
Tel:
0115 82 30090

Antimicrobial resistance is set to become one of the most serious global challenges of our time. Intense research efforts into antibiotic alternatives span many incredible innovations, from bacteriophage to antibody treatment.

At the University of Nottingham, Tim Self, Head of the School of Life Sciences Imaging Unit spoke to us about a collaborative project he has been involved in to develop antimicrobial gloves. These are designed for use in healthcare environments, where contamination is often spread inadvertently by the hands of healthcare workers. Reducing cross-contamination in healthcare environments will block the spread of infection at its root and reduce the need for harmful antibiotics.

Tim and colleague Robert Markus were invited to present a live/dead staining assay on stage in Brazil, but due to delivery disruptions they were left without the right microscope. Thankfully one of our pE-300 Series Illumination Systems came to the rescue and Tim shared the story with us.

How does the antimicrobial glove work?

The gloves are the first of their kind and contain a new type of antimicrobial molecule to kill micro-organisms on contact. This prevents them from spreading and nearly all microbes are killed within just five minutes of contact.

How has microscopy helped the development of antimicrobial gloves?

Light microscopy demonstrated that the glove was actually killing bacteria. For this we used a live/dead staining assay, where living microbes fluoresce a different colour from dead bacteria. This is based on two fluorescent dyes: a green-emitting dye which stains both living and dead bacteria, and a red-emitting dye which stains bacteria with damaged cell membranes (i.e. dying or dead cells). We were initially invited to perform the live experiment on stage at the Royal Society of Medicine in 2018. The pressure to perform an experiment with live bacteria on stage was high, but it worked really well. In fact, it worked so well that we were invited to repeat the experiment at a trade conference in Brazil as part of the launch of the glove in this part of the world.

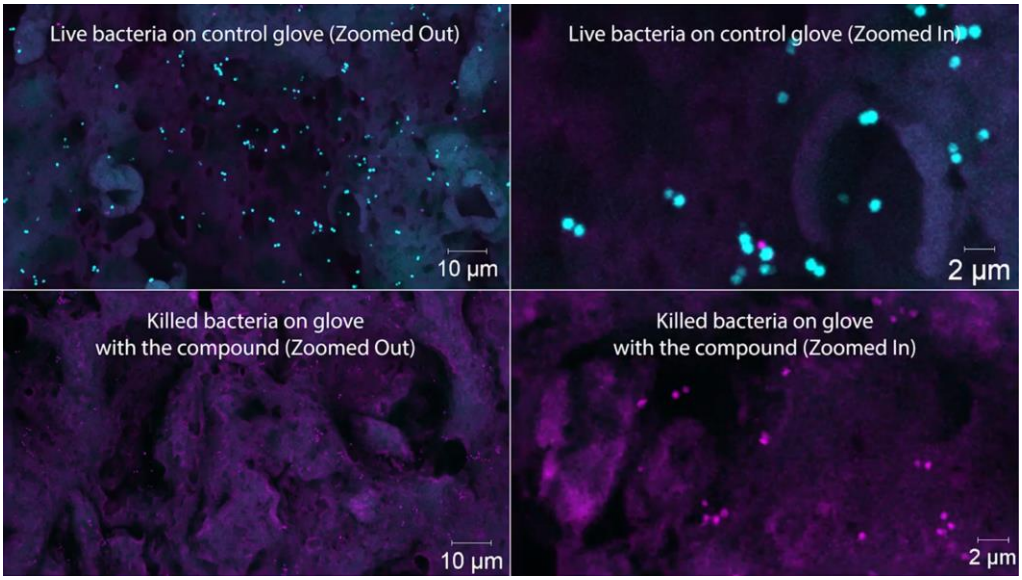

Figure 1: Live/dead staining using fluorescence microscopy. Living bacteria are observed on normal gloves (blue); antimicrobial gloves show only dead bacteria (purple). Images courtesy of Chemical Intelligence Ltd.

How did the CoolLED Illumination System save your demonstration?

We had arranged a few months previously for a microscope with its own internal LED to be shipped to Brazil. A couple of days before we were due to leave, it transpired that the microscope hadn't been delivered so we needed to provide our own microscope and illumination system. However, we didn't have the correct optical filters for the experiment, or even an illumination system. We borrowed the pE-300 Series Illumination System from a neighbouring lab, and they graciously allowed us to take it with us to Brazil. When we set up the microscope in Brazil, we managed with just one filter cube from some filters we already had in the lab with a Long Pass emission filter and a dichroic at 488 nm, but we didn't have any excitation filters. Thanks to the specific bandwidths of the LED light source, even with limited filters we were able to get the emission we needed to see the difference between the two fluorescent dyes and show the live and dead staining on the screen. To excite the green-emitting dye we used the 460 nm LED and simply switched to the GYR LED to view the red-emitting dye. We wouldn't have been able to do it without the LEDs delivering the excitation light we needed. The only way to make it work was to use the CoolLED Illumination System – that's how it saved us.

Were there any other factors that helped?

The CoolLED system is such a neat little system to use; it's so simple, it was brilliant. We just plugged it in and it worked. Where we had to dismantle the microscope each evening and take it back to the hotel, this (and its portability) really helped. Then we could focus on the tricky bit, which was the experiment and getting the bacteria to behave and stain properly. It was one of those situations where you work with what you've got and we made it work beautifully! The experiment was a success, all the presentations were well received, and it was brilliant. We returned with our reputation intact and a glow of success from a very eventful trip.

For more information on this antimicrobial glove technology, visit hartalega.com.my

If you would like to know more about the benefits LED technology can bring to your microscopy application, visit www.CoolLED.com